IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 5, 15 and 20 in accordance with the following:

1. (ORIGINAL) A method of controlling a track seek servo of a disk drive having a transducer and a disk with a plurality of tracks, comprising moving the transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave acceleration trajectory a(t) is used in a track seek mode.

2. (ORIGINAL) The method according to claim 1, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration.

3. (ORIGINAL) The method according to claim 1, wherein the asymmetrical sine wave acceleration trajectory has an acceleration section with a greater duration than that of a deceleration section.

4. (ORIGINAL) The method according to claim 1, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration, and an acceleration section with a greater duration than that of a deceleration section.

5. (CURRENTLY AMENDED) A method of controlling a track seek servo of a disk drive having a transducer and a disk with a plurality of tracks, comprising moving the transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave acceleration trajectory a(t) is used in a track seek mode; and ~~The method according to claim 1, further comprising~~ obtaining the asymmetrical sine wave acceleration trajectory a(t), and a velocity trajectory v(t) and a position trajectory x(t) that are based on the acceleration trajectory a(t), according to:

$$a(t) = \begin{cases} K_a I_a \sin\left[\dfrac{\pi}{T_a} t\right], & 0 \le t \le T_a \\ -K_a I_d \sin\left(\dfrac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

$$v(t) = \begin{cases} \dfrac{K_a I_a T_a}{\pi}\left[1 - \cos\left(\dfrac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \dfrac{2K_a I_a T_a}{\pi} + \dfrac{K_a I_d T_d}{\pi}\left[\cos\left(\dfrac{\pi}{T_d}(t - T_a)\right) - 1\right], & T_a \le t \le T_a + T_d \end{cases}$$

$$x(t) = \begin{cases} \dfrac{K_a I_a T_a}{\pi}\left[t - \dfrac{T_a}{\pi}\sin\left(\dfrac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \dfrac{K_a I_a T_a^{\,2}}{\pi} + \dfrac{2K_a I_a T_a - K_a I_d T_d}{\pi}(t - T_a) + \dfrac{K_a I_d T_d^{\,2}}{\pi^2}\sin\left(\dfrac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

wherein I_a, I_d, T_a, and T_d denote an acceleration current amplitude, a deceleration current amplitude, an acceleration time, and a deceleration time, respectively.

6. (ORIGINAL) An apparatus controlling a track seek servo of a disk drive having a transducer, a disk, and a voice coil, the apparatus comprising:

a seek trajectory producer calculating a design position value, a design velocity value, and a design acceleration value by applying an asymmetrical sine wave acceleration trajectory function a(t) in a track seek mode;

a state estimator determining an actual position value, an actual velocity value, and an actual bias value of the transducer as the transducer moves over the disk;

a first adder subtracting the actual position value from the design position value;

a position control gain compensator obtaining a position correction value by multiplying a resultant value output from the first adder by a predetermined position gain for position correction;

a second adder adding the position correction value to the design velocity value and subtracting the actual velocity value from the sum of the position correction value and the design velocity value;

a velocity control gain compensator obtaining a velocity correction value by multiplying a resultant value output from the second adder by a predetermined velocity gain for velocity correction;

a third adder adding the velocity correction value to the design acceleration value and subtracting the actual bias value from the sum of the velocity correction value and the design

acceleration value to obtain an acceleration correction value; and

an actuator varying a value of current supplied to the voice coil depending on the acceleration correction value to control movement of the transducer.

7. (ORIGINAL) The apparatus according to claim 6, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration.

8. (ORIGINAL) The apparatus according to claim 6, wherein the asymmetrical sine wave acceleration trajectory has an acceleration section with a greater duration than that of a deceleration section.

9. (ORIGINAL) The apparatus according to claim 6, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration, and an acceleration section with a greater duration than that of a deceleration section.

10. (ORIGINAL) The apparatus according to claim 6, wherein the asymmetrical sine wave acceleration trajectory a(t), and a velocity trajectory v(t) and a position trajectory x(t) based on the acceleration trajectory a(t), are given by:

$$a(t) = \begin{cases} K_a I_a \sin\left[\frac{\pi}{T_a} t\right], & 0 \le t \le T_a \\ -K_a I_d \sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

$$v(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[1 - \cos\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{2K_a I_a T_a}{\pi} + \frac{K_a I_d T_d}{\pi}\left[\cos\left(\frac{\pi}{T_d}(t - T_a)\right) - 1\right], & T_a \le t \le T_a + T_d \end{cases}$$

$$x(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[t - \frac{T_a}{\pi}\sin\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{K_a I_a T_a^2}{\pi} + \frac{2K_a I_a T_a - K_a I_d T_d}{\pi}(t - T_a) + \frac{K_a I_d T_d^2}{\pi^2}\sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

wherein I_a, I_d, T_a, and T_d denote an acceleration current amplitude, a deceleration current amplitude, an acceleration time, and a deceleration time, respectively.

11. (ORIGINAL) A disk drive comprising:

a disk storing data, the disk having a plurality of tracks;

a spindle motor rotating the disk;

a transducer writing data and reading data to and from the disk;

an actuator moving the transducer over a surface of the disk; and

a controller controlling the actuator to move the transducer from a space over a present track of the plurality of tracks to a space over a target track of the plurality of tracks using an asymmetrical sine wave acceleration trajectory a(t).

12. (ORIGINAL) The disk drive according to claim 11, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration.

13. (ORIGINAL) The disk drive according to claim 11, wherein the asymmetrical sine wave acceleration trajectory has an acceleration section with a greater duration than that of a deceleration section.

14. (ORIGINAL) The disk drive according to claim 11, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration, and an acceleration section with a greater duration than that of a deceleration section.

15. (CURRENTLY AMENDED) <u>A disk drive comprising:</u>

<u>a disk storing data, the disk having a plurality of tracks;</u>

<u>a spindle motor rotating the disk;</u>

<u>a transducer writing data and reading data to and from the disk;</u>

<u>an actuator moving the transducer over a surface of the disk; and</u>

<u>a controller controlling the actuator to move the transducer from a space over a present track of the plurality of tracks to a space over a target track of the plurality of tracks using an asymmetrical sine wave acceleration trajectory a(t);</u>

~~The disk drive according to claim 11,~~ wherein the asymmetrical sine wave acceleration trajectory a(t), and a velocity trajectory v(t) and a position trajectory x(t) based on the acceleration trajectory a(t), are given by:

$$a(t) = \begin{cases} K_a I_a \sin\left[\frac{\pi}{T_a} t\right], & 0 \le t \le T_a \\ -K_a I_d \sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

$$v(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[1 - \cos\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{2K_a I_a T_a}{\pi} + \frac{K_a I_d T_d}{\pi}\left[\cos\left(\frac{\pi}{T_d}(t - T_a)\right) - 1\right], & T_a \le t \le T_a + T_d \end{cases}$$

$$x(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[t - \frac{T_a}{\pi}\sin\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{K_a I_a T_a^2}{\pi} + \frac{2K_a I_a T_a - K_a I_d T_d}{\pi}(t - T_a) + \frac{K_a I_d T_d^2}{\pi^2}\sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

wherein I_a, I_d, T_a, and T_d denote an acceleration current amplitude, a deceleration current amplitude, an acceleration time, and a deceleration time, respectively.

16. (ORIGINAL) A computer-readable storage controlling a computer to control a track seek servo of a disk drive having a transducer and a disk with a plurality of tracks, the computer-readable storage comprising a process of moving a transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave acceleration trajectory a(t) is used in a track seek mode.

17. (ORIGINAL) The computer-readable storage according to claim 16, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration.

18. (ORIGINAL) The computer-readable storage according to claim 16, wherein the asymmetrical sine wave acceleration trajectory has an acceleration section with a greater duration than that of a deceleration section.

19. (ORIGINAL) The computer-readable storage according to claim 16, wherein the asymmetrical sine wave acceleration trajectory has a degree of acceleration that is less than a degree of deceleration, and an acceleration section with a greater duration than that of a deceleration section.

20. (CURRENTLY AMENDED) A computer-readable storage controlling a computer to control a track seek servo of a disk drive having a transducer and a disk with a plurality of tracks, the computer-readable storage comprising a process of moving a transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave acceleration trajectory a(t) is used in a track seek mode; and ~~The computer-readable storage according to claim 16, further comprising~~ obtaining the asymmetrical sine wave acceleration trajectory a(t), and a velocity trajectory v(t) and a position trajectory x(t) that are based on the acceleration trajectory a(t), according to:

$$a(t) = \begin{cases} K_a I_a \sin\left[\frac{\pi}{T_a} t\right], & 0 \le t \le T_a \\ -K_a I_d \sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

$$v(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[1 - \cos\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{2K_a I_a T_a}{\pi} + \frac{K_a I_d T_d}{\pi}\left[\cos\left(\frac{\pi}{T_d}(t - T_a)\right) - 1\right], & T_a \le t \le T_a + T_d \end{cases}$$

$$x(t) = \begin{cases} \frac{K_a I_a T_a}{\pi}\left[t - \frac{T_a}{\pi}\sin\left(\frac{\pi}{T_a} t\right)\right], & 0 \le t \le T_a \\ \frac{K_a I_a T_a^2}{\pi} + \frac{2K_a I_a T_a - K_a I_d T_d}{\pi}(t - T_a) + \frac{K_a I_d T_d^2}{\pi^2}\sin\left(\frac{\pi}{T_d}(t - T_a)\right), & T_a \le t \le T_a + T_d \end{cases}$$

wherein I_a, I_d, T_a, and T_d denote an acceleration current amplitude, a deceleration current amplitude, an acceleration time, and a deceleration time, respectively.

21. (ORIGINAL) A method of controlling a track seek servo of a disk drive having a transducer, a voice coil, and a disk with a plurality of tracks, comprising moving a transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave current is applied to the voice coil in a track seek mode.

22. (ORIGINAL) The method according to claim 21, wherein the asymmetrical sine wave current has a positive peak current value that is less than an absolute value of a negative peak current value.

23. (ORIGINAL) The method according to claim 21, wherein the asymmetrical sine wave current has a positive section with a greater duration than that of a negative section.

24. (ORIGINAL) The method according to claim 21, wherein the asymmetrical sine wave current has a positive peak current value that is less than an absolute value of a negative peak current value, and a positive section with a greater duration than that of a negative section.

25. (ORIGINAL) A disk drive comprising:

a disk storing data, the disk having a plurality of tracks and a voice coil;

a spindle motor rotating the disk;

a transducer writing data and reading data to and from the disk;

an actuator moving the transducer over a surface of the disk; and

a controller controlling the actuator to move the transducer from a space over a present track of the plurality of tracks to a space over a target track of the plurality of tracks by applying an asymmetrical sine wave current to the voice coil.

26. (ORIGINAL) The disk drive according to claim 25, wherein the asymmetrical sine wave current has a positive current value that is less than an absolute value of a negative current value.

27. (ORIGINAL) The disk drive according to claim 25, wherein the asymmetrical sine wave current has a positive section with a greater duration than that of a negative section.

28. (ORIGINAL) The disk drive according to claim 25, wherein the asymmetrical sine wave current has a positive peak current value that is less than an absolute value of a negative peak current value, and a positive section with a greater duration than that of a negative section.

29. (ORIGINAL) A computer-readable storage controlling a computer to control a track seek servo of a disk drive having a transducer, a plurality of tracks, and a voice coil, the computer-readable storage comprising a process of moving a transducer to a space over a target track of the plurality of tracks according to a track seek controlling process in which an asymmetrical sine wave current is applied to the voice coil in a track seek mode.

30. (ORIGINAL) The computer-readable storage according to claim 29, wherein the asymmetrical sine wave current has a positive peak current value that is less than an absolute value of a negative peak current value.

31. (ORIGINAL) The computer-readable storage according to claim 29, wherein the asymmetrical sine wave current has a positive section with a greater duration than that of a negative section.

32. (ORIGINAL) The computer-readable storage according to claim 29, wherein the asymmetrical sine wave current has a positive peak current value that is less than an absolute value of a negative peak current value, and a positive section with a greater duration than that of a negative section.

33. (ORIGINAL) The disk drive according to claim 11, further comprising:

a slider receiving the transducer and generating an air bearing in a space between the transducer and the surface of the disk;

a head gimbal assembly receiving the slider;

an actuator arm of the actuator attached to the head gimbal assembly and having a voice coil; and

a bearing assembly, the actuator arm rotating around the bearing assembly when current is supplied to the voice coil.

34. (ORIGINAL) An electrical system controlling a hard disk drive having a transducer, a voice coil motor with a voice coil, and a disk with a plurality of tracks, the electrical system comprising:

a controller controlling movement of the transducer from a current one of the tracks to a target one of the tracks using an asymmetrical sine wave acceleration trajectory;

a read/write channel connected to the controller and receiving a control signal from the controller to read data from, or write data to, the disk; and

a voice coil motor driver, the controller supplying a driving current to the voice coil and supplying a control signal to the voice coil motor driver to control movement of the transducer.